What is claimed is:

(1) A substrate material for mounting a semiconductor device, of an aluminum/silicon carbide(Al-SiC) composite alloy which comprises Al-SiC alloy composition part and non alloy composition part, wherein silicon carbide granular particles are dispersed from 10 to 70% by weight in the composite alloy, and silicon carbide is distributed homogeneously in the Al-SiC alloy composition part.

(2) The substrate material for mounting a semiconductor device, as set forth in claim 1, fabricated by the sintering method of sintering a pre-formed mixed starting material powders,

wherein the fluctuation of the concentration silicon carbide in the Al-SiC alloy composition part is within 1% by weight.

(3) The substrate material for mounting a semiconductor device, as set forth in claim 1, wherein the substrate material has a thermal conductivity of 100 W/m×K or higher and a thermal expansion coefficient of $20x10^{-6}$/°C or lower.

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(4) The substrate material for mounting a semiconductor device as claimed in claim 1, wherein the silicon carbide granular particles are dispersed from 35 to 70% by weight.

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(5) The substrate material for mounting a semiconductor device, as set forth in claim 4, wherein the substrate material has a thermal conductivity of 180 W/m×K or higher.

(6) The substrate material for mounting a semiconductor device as claimed in claim 1, wherein the composite alloy contains aluminum carbide formed at an interface between aluminum or

aluminum alloy and silicon carbide.

(7)The substrate material for mounting a semiconductor device as claimed in claim 6, wherein the amount of the aluminum carbide is lower than 5% by weight.

(8)The substrate material for mounting a semiconductor device as claimed in claim 7, wherein the silicon carbide composite alloy has a thermal conductivity of 180 W/m×K or higher.

(9)The substrate material for mounting a semiconductor device as claimed in claim 6, wherein aluminum carbide is distributed at the interface between the silicon carbide and the aluminum or aluminum alloy in such an amount that the ratio of the peak intensity for aluminum carbide (012) to that for aluminum (200) both determined by X-ray analysis with CuK_{α} line is not more than 0.025.

(10) The substrate material for mounting a semiconductor device as claimed in claim 9, wherein the ~~/sili~~con carbide composite alloy has a thermal conductivity of 180 W/m×K or higher.

(11) The substrate material for mounting a semiconductor device as claimed in claim 1, wherein the composite alloy contains silicon as a component of a solid solution therein or as a precipitate.

(12) The substrate material for mounting a semiconductor device as claimed in claim 1, wherein the aluminum/silicon carbide composite alloy contains nitrogen in an amount of from 0.01 to 1% by weight.

(13) The substrate material for mounting a semiconductor device as claimed in claim 1, wherein the aluminum/silicon carbide

composite alloy contains oxygen in an amount of from 0.05 to 0.5% by weight.

(14) The substrate material for mounting a semiconductor device as claimed in claim 1, wherein the aluminum/silicon carbide composite alloy contains β-SiC as the silicon carbide.

(15) The substrate material for mounting a semiconductor device as claimed in claim 1, wherein the silicon carbide granular particles have an average particle diameter of from 1 to 100 μm.

(16) The substrate material for mounting a semiconductor device as claimed in claim 14, wherein the silicon carbide granular particles have an average particle diameter of from 10 to 80 μm.

(17) The substrate for mounting a semiconductor device, which comprises a substrate made of the substrate material as claimed in claim 1, and a coating layer coated on a surface of the substrate.

(18) The substrate for mounting a semiconductor device, as claimed in claim 17, wherein the coating layer is a plating layer.

(19) The substrate for mounting a semiconductor device, as claimed in claim 17, wherein the coating layer is a chromate film.

(20) The substrate for mounting a semiconductor device, as claimed in claim 17, wherein the coating layer is a layer of an oxide of either aluminum or silicon.

(21) The substrate for mounting a semiconductor device, as claimed in claim 17, wherein the coating layer is a multilayer structure film comprising a first metal layer having

a Young's modulus of 15,000 kg/mm^2 or lower and a second metal layer formed on the first metal layer, and the second metal layer is made of at least one metal selected from nickel and gold.

(22)The substrate for mounting a semiconductor device, as claimed in claim 17, wherein the coating layer is a multilayer structure film comprising a first metal layer having a melting point of 600°C or lower and a second metal layer formed on the first metal layer, and the second metal layer is made of at least one metal selected from nickel and gold.

(23)The substrate for mounting a semiconductor device, as claimed in claim 17, wherein the coating layer comprises a layer of at least one organic resin selected from an epoxy resin, a silicone resin, a polyimide resin, and the like each containing a metallic filler or not.

(24)The substrate for mounting a semiconductor device, as claimed in claim 23, wherein the coating layer further comprises a second metal layer made of at least one metal selected from nickel and gold, formed on the layer of organic resin.

(25)The substrate for mounting a semiconductor device, as claimed in claim 17, wherein the coating layer comprises aluminum as the main component.

(26)The substrate for mounting a semiconductor device, as claimed in claim 25, wherein the coating layer is made up of crystal grains comprising aluminum and having a diameter of from 0.1 to 10 μm.

(27)The substrate for mounting a semiconductor device, as

claimed in claim 26, wherein the coating layer is further covered with an oxide layer having a thickness of from 10 to 800 Å.

(28) The substrate for mounting a semiconductor device, as claimed in claim 25, wherein the substrate has a surface roughness of from 0.1 to 20 μm in terms of R_{max}.

(29) The substrate for mounting a semiconductor device, as claimed in claim 28, wherein the substrate has a surface roughness of from 0.1 to 8 μm in terms of R_{max}.

(30) The substrate for mounting a semiconductor device, as claimed in claim 28, wherein the substrate comprises holes having a depth of 100 μm or smaller on the surface thereof.

(31) The substrate for mounting a semiconductor device, as claimed in claim 28, wherein the aluminum coating layer has a purity of 99.9% or higher.

(32) The substrate for mounting a semiconductor device, as claimed in claim 25, wherein the coating layer has a thickness of from 1 to 100 μm.

(33) The substrate for mounting a semiconductor device, as claimed in claim 32, wherein the coating layer has a thickness of from 1 to 20 μm.

(34) A semiconductor device, which comprises the substrate material as claimed in claim 1 or the substrate as claimed in claim 17, and a semiconductor chip mounted on the substrate.

(35) A method of producing a substrate material of an aluminum/silicon carbide composite alloy by the sintering method, wherein the method comprises steps of:

mixing an aluminum powder and silicon carbide powder to form an aluminum/silicon carbide starting powder mixed homogeneously;

compacting the aluminum/silicon carbide starting powder having a silicon carbide content of from 10 to 70% by weight to form a compact;

and sintering the compact at a temperature of 600°C or higher in a non-oxidizing atmosphere to thereby obtain an aluminum/silicon carbide composite alloy.

(36)The method of producing a substrate material as claimed in claim 35, wherein the sintering step is conducted at the temperature within a range of from 600 to 750°C.

(37)The method of producing a substrate material as claimed in claim 35, wherein the sintering step is conducted in a nitrogen atmosphere having a nitrogen concentration of 99% by volume or higher.

(38)The method of producing a substrate material as claimed in claim 35, wherein the sintering step is conducted in an atmosphere having an oxygen concentration of 200 ppm or lower.

(39)The method of producing a substrate material as claimed in claim 35, wherein the sintering step is conducted in an atmosphere having a dew point of -20°C or lower.

(40)A method of producing a substrate for mounting a semiconductor chip as claimed in claim 35, further comprising the step of repressing the aluminum/silicon carbide composite alloy obtained by sintering the aluminum/silicon carbide starting

powder, or repressing them and then heating in a non-oxidizing atmosphere so as to prevent from oxidizing aluminum.

(41) A method of producing a substrate made of an aluminum/silicon carbide composite alloy by the sintering method, comprising the steps of:

mixing an aluminum powder and silicon carbide powder to form an aluminum/silicon carbide starting powder having a silicon carbide content of from 10 to 70% by weight;

compacting the aluminum/silicon carbide starting powder to form a compact;

sintering the compact at a temperature of 600°C or higher in a non-oxidizing atmosphere for aluminum to thereby obtain a formed substrate made of an aluminum/silicon carbide composite alloy;

and forming a coating layer on a surface of the pre-formed substrate to thereby obtain the substrate .

(42)The method of producing a substrate as claimed in claim 41, wherein the step of forming a coating layer is:

heating the substrate in an oxidizing atmosphere;

or exposing the substrate to a steam atmosphere.

(43) The method of producing a substrate as claimed in claim 41, wherein the step of forming a coating layer comprises steps of:

forming a layer of a metal having a Young's modulus of 15,000 kg/mm^2 or lower on the substrate material;

polishing the metal layer;

and plating the polished metal layer with at least one metal

selected from nickel and gold.

(44)The method of producing a substrate as claimed in claim 41, wherein the step of forming a coating layer comprises steps of:

forming a layer of a metal having a melting point of 600°C or lower on the substrate surface;

heating the metal layer to a temperature not higher than 600°C; and plating the metal layer with at least one metal selected from nickel and gold.

(45)The method of producing a substrate as claimed in claim 41, wherein the step of forming a coating layer comprises steps of:

forming a layer of at least one organic resin selected from an epoxy resin, a silicone resin, a polyimide resin, and the like each containing a metallic filler or not on the substrate surface.

(46)The method of producing a substrate as claimed in claim 45, wherein the step of forming a coating layer further comprises steps of:

plating a metal layer made of at least one metal selected from nickel and gold on the layer of organic resin.

(47)The method of producing a substrate as claimed in claim 46, wherein the forming step of a layer of a metal having a Young's modulus of 15,000 kg/mm^2 or lower on the substrate is conducted by barrel plating.

(48)The method of producing a substrate as claimed in claim 47, whrein the barrel plating is conducted in a container which

contains metal spheres having a particle diameter of from 0.1 to 10 mm and having the same composition as the deposit to be formed.

(49) The method of producing a substrate as claimed in claim 48, wherein the spheres contained in the container for use in barrel plating have a surface area which is at least two times that of the corresponding true spheres.